TDSi ACCESS CONTROL

Installation manual

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Introduction

System capabilities

eXcel[4] is a four-door access control unit (ACU) that is administered by a computer (PC) running TDSi's eXguard software. More than one controller can be administered simultaneously from one or more computers, and TDSi manufacture several controller types besides eXcel[4] that can co-exist in a single system.

The software is used to monitor events and to program ACUs with card numbers, access rules and other parameters such as input and relay functions. The software does not need to be running continuously, as ACUs hold all the information they need to provide the security features that have been set up.

When eXcel[4] is used as a two-door controller, four inputs and two relays become "spare" and may be used for monitoring and control of other equipment.

Feature	Four-door configuration	Two-door configuration
Maximum number of readers per door (readers may have associated keypads)	1	2
Egress inputs	4	2
Door sensor inputs	4	2
Spare Inputs	0	4
Spare Relays	0	2
Card capacity (with eXguard Lite)	5 000	
Card capacity (with eXguard Pro)	18 000	
Anti pass-back (with eXguard Lite)	Timed	
Anti pass-back (with eXguard Pro)	Timed or True	
Mantrap	Yes	
Time groups	64	
Card expiry by date	Yes	

Technical specification

Case dimensions (cm)	38 x 33 x 14
Environment	**Temperature**: -10°C to +40°C **Humidity**: 0-95% rh non-condensing
Power (230V AC version)	**Input**: 200-240V AC, 80VA max. **Output**: 12V DC 1A for ACU, 2 x 12V DC 1A for locks, 2 x 13.6V for standby batteries
Power (110V AC version)	**Input**: 100-120V AC, 80VA max. **Output**: as for 240V AC version
Power (18V AC version)	**Input**: 14-18V AC, 80VA max. **Output**: as for 240V AC version
Power (12V DC version)	**Input**: 12V DC 500 mA max
Relays	Form C changeover rated at 30V 2A

Planning

Options to choose before starting

Additional to an eXcel[4] ACU and a computer running eXguard software, a basic installation requires only card readers and electric lock mechanisms. Additional features are available, i.e. door sensor, egress input, inputs and relays.

Options for all of these are listed below and factors affecting the choice are explained.

Card reader

Choose an appropriate technology – the choice includes infra-red (Microcard), mag-stripe, proximity, hands free and biometrics.

If there is no pre-existing reason for choosing one technology over another (e.g. if the cards have also to be used in an other system such as a time-and-attendance recorder) then the choice of technology will be based on cost of readers, cost of cards, level of security offered and personal preference:

Technology	Reader cost	Card Cost	Security*	Other issues
Mag-stripe	Low	Low	Low	Mis-reads are common. Readers are usually not weatherproof. Cards are easily damaged through accidental erasure of the coding.
Wiegand	Medium	Medium	Medium	Old technology; often site-specific so long lead-times at manufacture
Infra-red (Microcard)	Medium	Medium	Medium	Small readers, mis-reads are rare. Cards are more secure and more robust than mag-stripe.
Proximity	High	Medium to High	High	Easy to use and rapidly growing in popularity as prices come down. Most cards are "passive" (i.e. contain no battery) and therefore have an unlimited life.
Hands-free	High	High	High	Can read at unwanted times; e.g. walking down corridors past doors. Most cards are "active" (i.e. contain a battery) and therefore have a limited life.
Smart Card (e.g. Mifare)	High	High	High	Can be useful where several different systems are installed and only one card per person is wanted.

*Card security – the risk of copying - is not a single issue. It involves the need for time, equipment, money, and special material. It also includes the risk of the copying being detected.

TDSi supplies a wide range of readers suitable for use with eXcel[4]. Other manufacturers' readers MAY work if the interface meets the following specifications but this cannot be guaranteed – please contact your supplier for guidance.

Mag-stripe: Track 2 ABA format; the last 8 digits preceding the first field separator will be read as the card number.

Wiegand: 26-bit standard format (7 bits for the 3-digit site code, 15 bits for the 5-digit card number, and 2 parity bits). eXcel[4] will concatenate the site code and card number to give an 8-digit card number – eXcel[4] does not limit the range of site codes that can be used.

Card reader with keypad

Security is enhanced if a person is required to enter a personal identification number (PIN) after presenting a card. This makes it less likely that a lost or stolen card can be used. TDSi supplies a range of readers with integrated keypads suitable for use with eXcel[4]. Other manufacturers' readers MAY work if the interface meets the following specifications but this cannot be guaranteed – please contact your supplier for guidance.

Mag-stripe: Track 2 ABA format; the last 8 digits preceding the first field separator will be read as the card number. Each key press is transmitted as a 1-digit card number.

Wiegand: 26-bit standard format (7 bits for the 3-digit site code, 15 bits for the 5-digit card number, and 2 parity bits). eXcel[4] will concatenate the site code and card number to give an 8-digit card number – eXcel[4] does not limit the range of site codes that can be used. Each key press is transmitted as a 1-digit card number.

Lock

The choice of lock depends firstly on the door – electric strikes or bolts, magnetic locks, turnstiles or barriers are all options depending firstly on the architecture – and secondly on the required resistance to attack.

As the "lock" is normally located on the edge of the door furthest from the hinge, double-doors represent a special case unless one door is fixed closed during normal operation (i.e. it is normally opened only for emergencies or to allow large objects to pass through).

Another special case is a door that "swings" – i.e. opens both inwards and outwards so it can be pushed open from either side. Frameless glass doors also require specialist solutions.

All lock types have their advantages and disadvantages – if unsure which type to choose then gather as much information as possible about the door and seek advice from a supplier.

Magnetic locks

Magnetic locks have become very popular as they provide rapid solutions in a wide variety of circumstances – often without the need for major surgery to the door, frame or pre-existing "furniture".

There are two types: face-to-face for outward opening doors and shear locks for inward opening and swing doors. These locks are available in a range of strengths and designs. Note that some designs will reduce "headroom" and may have health-and-safety implications if there is a risk of injury from the metal edges of the mechanism.

Door sensor

A door sensor can serve two purposes:

- For access control, the door sensor provides an extra level of security, in the following way. If the lock release time is set to, say, 10 seconds, it is quite possible for someone to pass through the door in only two or three seconds after using their card. This leaves seven or eight seconds of 'un–expired' time, during which (if no door sensor was fitted) the door could still be opened. However, if a door sensor is fitted, then as soon as the door opens the lock release is de–energised and the door re–locks as it closes.
- For access monitoring, having a door sensor fitted means that all occurrences of the door opening and closing can be monitored. Also, a relay can be set to operate – and thereby sound an alarm – if a door opens when it shouldn't (i.e. the access control system had not released the lock), or stays open for too long.

Note that the output from monitored mag-locks is not suitable for either of these functions.

Egress button

An Egress button allows people through a door – from the secure area to a less secure area – without the use of a card or PIN. Pushing the button causes the lock to be released, just as if a card had been entered (i.e. for the pre–programmed 'lock release time').

This is sometimes used as a 'reception' button, where someone inside the building can let someone else in.

More commonly, the egress button permits a person to exit the building or room. Although certain types of door lock mechanisms permit egress by turning the handle on the inside, this may be detected by the ACU as a 'door forced' situation. In other words, the door has opened but no card or PIN was used. Installing an egress button bypasses this problem.

Note that fire regulations may also require people to be able to exit an area without depending in any way on electrical systems.

Door Ajar Sounder

An access control system is useless if the door is propped open. If a door sensor is fitted, then a sounder can be used to alert anyone in the vicinity that this has happened. Loud buzzers are very effective at persuading people not to do this in the first place!

eXcel^4 has an on-board buzzer that is used for this purpose, but this can be disabled and an external sounder can be connected to a spare relay.

Inputs

eXcel^4, when used in a two-door configuration, has 4 spare inputs which can be used to monitor other equipment. Every instance of an input going open-circuit and closed-circuit is logged by eXguard and can be reported on. An input can also trigger a spare relay.

All inputs are suitable for use with supervision resistors, which provide a means of detecting tampering. 1-resistor supervision allows detection of a short-circuit, while 2-resistor supervision allows detection of both open- and short-circuit tampering.

Relays

eXcel^4, when used in a two-door configuration, has 2 spare relays which can be used in various ways to control another piece of equipment; for example: lighting, heating or a sounder. A relay can be triggered by one of the following:

- Input
- Control card
- Manual command
- Time schedule

Cable specifications

Always use suitable cable. Access control systems differ from intruder alarm systems in that reader and communications cables carry high-speed data signals that can become distorted or corrupted if inadequate cable is used. The following table lists suitable cable specifications for each type of equipment.

	Recommended Cable type	**Cores**	**Max. Distance**
TDSi IR Reader	Belden 9729	4	140m
	FBOS2P24	4	100m
	0S2P22/Alpha 5902/ Belden 9502	4	60m
	OS4C24/Alpha 5094/BICC H8123	4	40m
	Screened Alarm Cable	8	Up to 30m
Magnetic Stripe Reader	Belden 9730	6	60m
	Belden 9503	6	25m
	OS6C24/Alpha 5096/BICC H8124	6	20m
	Screened Alarm Cable	8	Up to 30m
Indala Proximity Reader & TDSi eXprox reader	Belden 9730	6	150m
	Belden 9503	6	60m
	OS6C24/Alpha 5096/BICC H8124	6	50m
	Screened Alarm Cable	8	Up to 30m
Keypad	Belden 9729	4	140m
	FBOS2P24	4	100m
	0S2P22/Alpha 5902/Belden 9502	4	60m
	OS4C24/Alpha 5094/BICC H8123	4	40m
	Screened Alarm Cable	8	Up to 20m
RS232 Communications	Belden 9534 or 7/0.2mm (Screened)	4	15m
RS485 Communications	Belden 9729	4	1200m
	FBOS2P24	4	900m
	0S2P22/Alpha 5902/Belden 9502	4	530m
	OS4C24/Alpha 5094/BICC H8123	4	400m
	Screened Alarm Cable	8	300m
Inputs	7/0.2mm (Screened)	2	300m
Relays	7/0.2mm or 16/0.2mm (Screened)	2	Dependant on load and cable choice

Basic Installation

Installation do's and don'ts

It is vital to observe anti–static precautions when working inside the ACU cabinet.

Solder and tape all connections. DO NOT use crimps or B–connectors or wire nuts or punch–down blocks. Each ACU must be grounded to a good mains ground. This can be achieved via the ground wire (cable shield) from the power supply or by a separate wire to mains ground.

All cable runs must be in shielded cable. The shield of each cable must be grounded at one end, and at one end only. This will usually be at the ACU chassis plate. However, if the peripheral equipment is grounded then the shield of the cable must be grounded at the peripheral end and not at the ACU end.

Cable runs must be at least 6 feet (2 metres) long. This allows induced static to dissipate before it reaches the electronics.

The braid of the cables (or the drain wire or ground wire) must be terminated to the spring earthing clamps which are mounted to the chassis plate (unless the peripheral is connected to ground - see below). The "pig tails" of the screened cable should be kept as short as possible to reduce the radiating length.

The lengths of un-shielded wire should be kept to an absolute minimum. This will reduce the chances of noise pick up. They must not be allowed to protrude into the area of the electronics.

Where metal-cased peripheral equipment (lock release, card reader etc.) is to be mounted on a metal surface (e.g. a metal doorframe) ensure that the metal surface is grounded and that the cable ground wire is connected at the peripheral end. The cable ground wire must not be connected at the ACU end.

Where peripheral equipment (lock releases, card reader's etc.) is to be mounted on a non-metal surface, the peripheral must not be grounded independently and the ground wire must not be taken to a local ground. If the peripheral is metal-cased then the ground wire can be connected to the metal case.

When using RS485 communications, attention must be paid to the special earthing requirements detailed in the section titled "Communications".

In addition to these general principles, it is vital to follow the specific requirements for installing peripheral equipment (readers, lock releases etc). These requirements are explained in the relevant places of this manual.

Please note that in all recommendations for wire, minimum gauge requirements are listed. It is the responsibility of the installing company to follow all local and national electrical codes as they apply.

Never install any access control system until approval has been obtained from local fire authority. In particular note that the use of an exit (egress) button may not be legal. Single–action exit may be required.

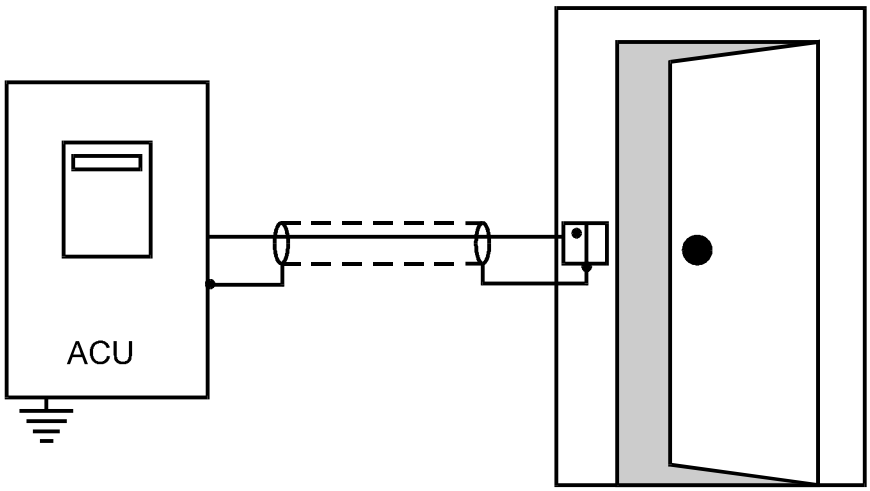
The use of shielded cable, and adherence to correct grounding procedures, is necessary for every connection to the controller.

Terminating screened cable at the ACU

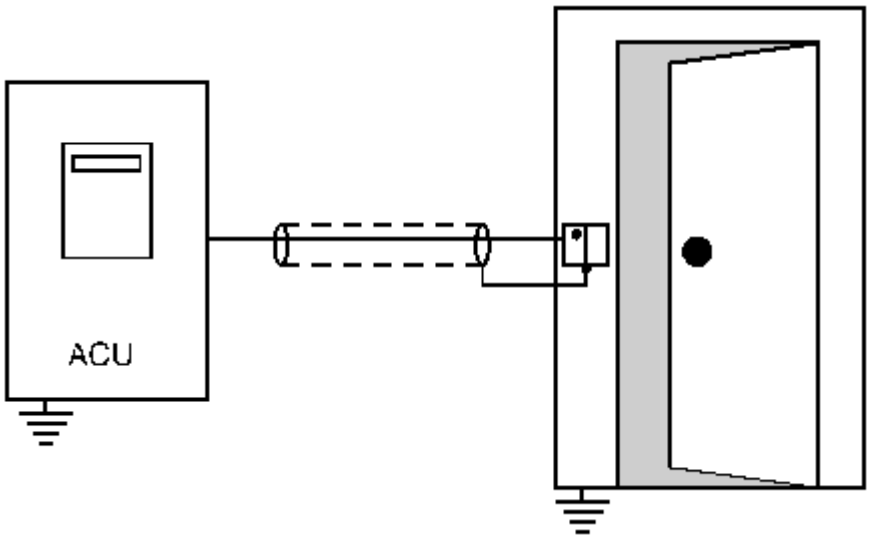
It may or may not be necessary to terminate cable screens at the ACU end. The following diagrams show when it is necessary, and how to do it to maximise the effectiveness of the screening.

When to terminate

The following two diagrams show correct methods of grounding cable shields, where the peripheral equipment may or may not be connected to ground already.



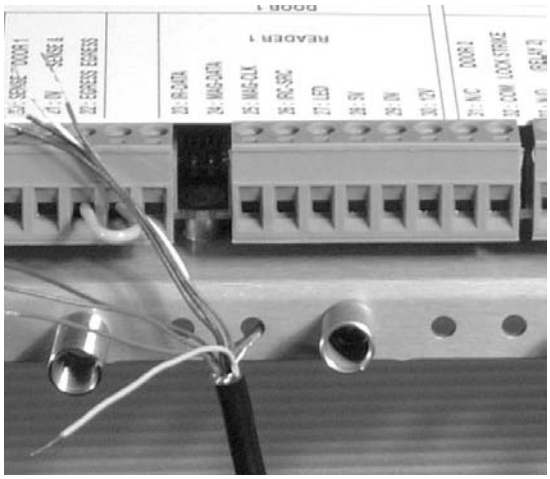
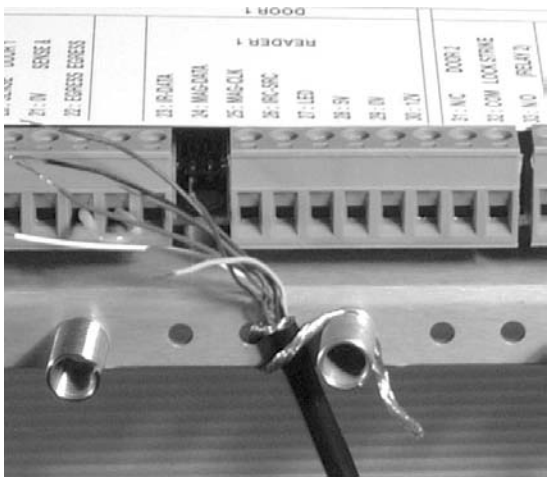
Peripheral mounted on NON-METAL surface



Peripheral mounted on METAL surface

How to terminate

The following pictures show how the cable screen should be terminated to the ACU chassis. This also holds the cable firmly in place while terminating the cable cores. If you are not terminating the cable screen to the chassis, use a cable tie through the holes to hold the cable in place.

	Before terminating the cable cores have feed the twisted screen braid through the hole nearest the connector.
	Feed the braid round the cable, pull the spring towards you and pull the braid down into the gap nearest the chassis. Make sure the screen is completely within the spring and that it points away from the connector blocks.

Readers

This section covers the most popular readers currently supplied by TDSi. For any other reader, please refer to the documentation that came with the reader. Installation of readers with combined keypads is covered in **Installing extra features**.

eXprox Proximity readers (5002-0350, 5002-0352, 0357)
Digital IR reader (5002-0372)
Mag-stripe reader (5002-0360)

eXcel terminal	Reader connection	Colour
14	Reader 1 MAG-DATA	Yellow
15	Reader 1 MAG-CLK	White
16	Reader 1 LED	Blue
12	Reader 1 5V	Green
18	Reader 1 0V	Black
17	Reader 1 12V	Red
28	Reader 2 12V	Red
25	Reader 2 MAG-DATA	Yellow
26	Reader 2 MAG-CLK	White
27	Reader 2 LED	Blue
39	Reader 2 5V	Green
29	Reader 2 0V	Black
28	Reader 3 12V	Red
30	Reader 3 MAG-DATA	Yellow
31	Reader 3 MAG-CLK	White
32	Reader 3 LED	Blue
39	Reader 3 5V	Green
29	Reader 3 0V	Black
44	Reader 4 12V	Red
41	Reader 4 MAG-DATA	Yellow
42	Reader 4 MAG-CLK	White
43	Reader 4 LED	Blue
40	Reader 4 5V	Green
45	Reader 4 0V	Black

Indala Proximity Reader (5002-0133)

eXcel terminal	Reader connection	Colour
14	Reader 1 Wiegand 0	Green
15	Reader 1 Wiegand 1	White
16	Reader 1 LED	Brown
18	Reader 1 0V	Black
17	Reader 1 12V	Red
28	Reader 2 12V	Red
25	Reader 2 Wiegand 0	Green
26	Reader 2 Wiegand 1	White
27	Reader 2 LED	Brown
29	Reader 2 0V	Black
28	Reader 3 12V	Red
30	Reader 3 Wiegand 0	Green
31	Reader 3 Wiegand 1	White
32	Reader 3 LED	Brown
29	Reader 3 0V	Black
44	Reader 4 12V	Red
41	Reader 4 Wiegand 0	Green
42	Reader 4 Wiegand 1	White
43	Reader 4 LED	Brown
45	Reader 4 0V	Black

Locks

The following instructions assume that the lock(s) will be powered from the built-in power supply (this is subject to a maximum peak current of 1A per lock). If a separate power supply is used, modify the wiring accordingly.

IMPORTANT: A suppressor MUST be fitted at the lock. TDSi supplies a suitable suppressor (part number 5002-0095), or a diode/capacitor combination or MOV device (Metal Oxide Varistor) may be used.

Fail-locked

This kind of lock requires power to unlock:

eXcel terminal	Lock connection
20	Door 1 Lock relay pole
21	Door 1 Lock relay n/o
34	Door 2 Lock relay pole
35	Door 2 Lock relay n/o
47	Door 3 Lock relay pole
48	Door 3 Lock relay n/o
53	Door 4 Lock relay pole
54	Door 4 Lock relay n/o

Fail-open

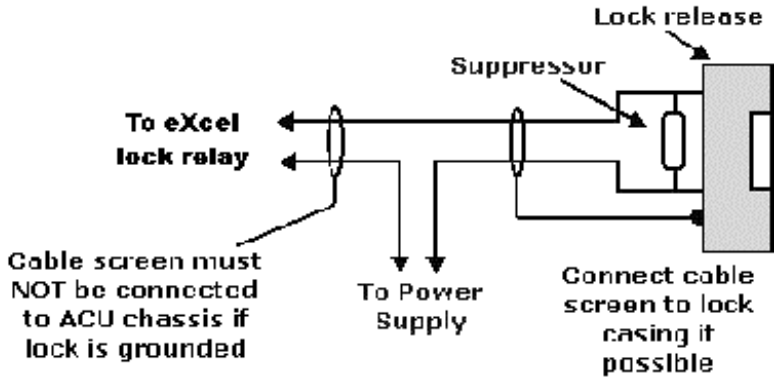
This kind of lock is locked when power is applied:

eXcel terminal	Lock connection
19	Door 1 Lock relay n/c
20	Door 1 Lock relay pole
33	Door 2 Lock relay n/c
34	Door 2 Lock relay pole
46	Door 3 Lock relay n/c
47	Door 3 Lock relay pole
52	Door 4 Lock relay n/c
53	Door 4 Lock relay pole

Power supply for locks

The built-in power supply (if fitted) has two outputs which can supply a maximum peak current of 1A per output. DO NOT combine the two supplies to provide extra current.

eXcel terminal	Lock connection
P3	Lock supply “A” +12V DC
P4	0V
P5	Lock supply “B” +12V DC
P6	0V



If the lock requires more than 1A pull-in current, substitute a separate relay for the lock release shown in the diagram above and use this to switch a separate power supply.

Communications

Single ACU over RS232

Most computers these days use 9-way connectors for serial communication ports, but we've included the connections for 25-way connectors as well.

PC 9-way	PC 25-way	eXcel terminal	PC Function
2	3	7	Receive
3	2	6	Transmit
5	7	5	Ground
no connection	no connection	8	RTS
no connection	no connection	9	CTS

If necessary, a USB-to-serial adaptor may be used to add a serial port to a computer. However, the use of multi-port adaptors is not recommended because data can be lost due to increased load on a single USB port.

One or more units over RS485

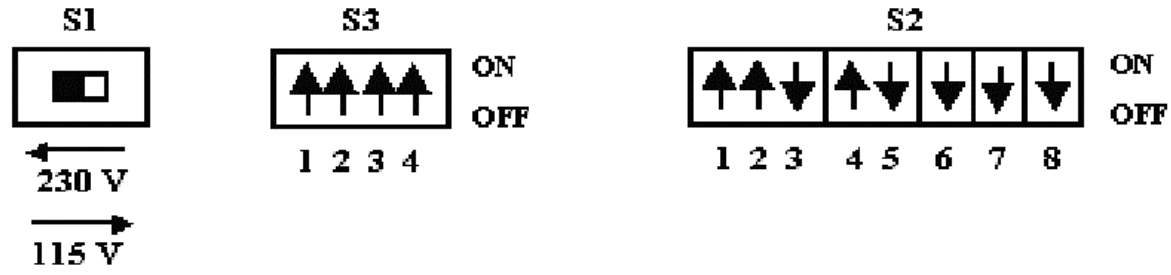
This requires the use of an RS232 to RS485 converter. TDSi supply a suitable product (Westermo MA-45) and the following wiring instructions relate to this converter. Other manufacturers' converters MAY work if the interface meets the international standards for RS485 but this cannot be guaranteed – please contact your supplier for guidance.

IMPORTANT: When connecting more than one unit using RS485, the cable must be run from unit to unit as a "daisy-chain". Multi-drop or "star" cable runs are not suitable for RS485 applications. However, it is permissible to have the cable run in two directions from the RS485 converter.

PC to MA-45			
PC 9-way	**PC 25-way**	**MA-45 25-way**	**Function**
2	3	3	Receive
3	2	2	Transmit
5	7	7	Ground

MA-45 to eXcel[4]		
MA-45 5-way	**eXcel terminal**	**Function**
1	2	RS485 Rx A
2	1	RS485 Rx B
3	4	RS485 Tx A
4	3	RS485 Tx B
5	No connection	
	eXcel chassis	Cable screen

MA-45 switch settings



S3 settings			**S2 settings**		
1	ON	Terminated 4-Wire	1	ON	Baud rate
2	ON		2	ON	
3	ON		3	OFF	
4	ON		4	ON	10-bit word
			5	OFF	
			6	OFF	4-wire
			7	OFF	RTS control
			8	n/a	not used

eXcel4 switch settings

All switches OFF (DOWN)

One or more units over Ethernet using TCP/IP

eXcel[4] features a built-in Ethernet port (called Xport) with an RJ-45 socket, which is suitable for 10Mb and 100Mb networks. An eXcel[4] can also be directly to a computer using a crossover cable.

In an installation with more than one eXcel[4], all of the units can be connected using their Ethernet ports. Alternatively, some of the eXcel[4] units can be connected to other eXcel[4] units via their RS485 ports.

If you are connecting to an existing network	Establish with the network administrator: • the IP address of the computer(s) that will be running eXguard applications (or permissible addresses and subnet masks for those computers) • permissible IP addresses for each access control unit that will be connected to the network
If you are connecting to a network dedicated to the access control system	Make sure that TCP/IP protocol is installed on the computer(s) that will be running eXguard applications. Give each computer an IP address in the range 10.0.0.254; 10.0.0.253 etc.; and a subnet mask of 255.255.255.0

Instructions for Ethernet connection	
1.	Before connecting the Ethernet port to anything, re-position the 5 dip-switches to the ON position (up). These switches enable the port, and provide RS485 end-of-line termination.
2.	Connect the eXcel[4] to the network or computer. If there is more than one eXcel[4], they can all be connected at this stage – but make a note of the UID number of each unit and its location to help you identify which unit is which during setup. If required, to confirm that the network is connected correctly, you can observe the light inside the Ethernet port: an amber light means a connection at 10Mb/s; a green light means a connection at 100Mb/s
3.	Install and run the Lantronix XPort Installer software (in the Extras folder on the Documentation CD supplied with the eXcel[4], and on the eXguard CD). Click the Search button - this will detect all eXcel4 units in the system and display their automatically-assigned IP addresses. **Note**: this process may require several attempts. If you do not see all of the expected units, keep pressing the Search button and dismissing any error messages. At this stage you will not be able to tell which one is which.
4.	For each unit that has been detected: • Select the unit in the list • Observe the UID number of the unit in the list on the right (under e-mail notification – unit name) • Click the Assign IP button • Enter a suitable IP address (If this is a dedicated network, start at 10.0.0.1, then 10.0.0.2, and so on) • Click on the OK button and wait for the Xport to re-boot, and for the new IP address to appear in the list.
5.	Close the Lantronix Xport Installer. Install and run eXguard software and add the eXcel[4] units into the database using the IP addresses assigned in step 4.

connecting one eXcel[4] to another		
eXcel terminal	**eXcel terminal**	**Function**
2	2	RS485 Rx A
1	1	RS485 Rx B
4	4	RS485 Tx A
3	3	RS485 Tx B

Installing extra features

This section covers the following optional installations:

- Readers with keypads
- Door Sensors
- Egress buttons
- Inputs
- Relays

Readers with keypads

The following table covers the most popular reader/keypads being supplied currently by TDSi. For any other reader/keypad combination, please refer its own documentation.

TDSi Proximity reader with keypad (part number 5002-0317)
Mag-stripe reader with keypad (part number 5002-0316)
Digital Microcard reader with keypad (part number 5002-0315)

eXcel terminal	Reader CN1 terminal	Function
14	Reader 1 Terminal 4	Data
15	Reader 1 Terminal 3	Clock
16	Reader 1 Terminal 5	LED
12	Reader 1 Terminal 2	+5V DC
18	Reader 1 Terminal 1	0V
17	Reader 1 Terminal 6	+12V DC
28	Reader 2 Terminal 6	+12V DC
25	Reader 2 Terminal 4	Data
26	Reader 2 Terminal 3	Clock
27	Reader 2 Terminal 5	LED
39	Reader 2 Terminal 2	+5V DC
29	Reader 2 Terminal 1	0V
28	Reader 3 Terminal 6	+12V DC
30	Reader 3 Terminal 4	Data
31	Reader 3 Terminal 3	Clock
32	Reader 3 Terminal 5	LED
39	Reader 3 Terminal 2	+5V DC
37	Reader 3 Terminal 1	0V
44	Reader 4 Terminal 6	+12V DC
41	Reader 4 Terminal 4	Data
42	Reader 4 Terminal 3	Clock
43	Reader 4 Terminal 5	LED
40	Reader 4 Terminal 2	+5V DC
45	Reader 4 Terminal 1	0V

Door sensors

Most door sensors have contacts that are closed when the door is closed. If fitting one where the opposite is true, make the appropriate selection in eXguard.

If no door sensor is to be fitted then the factory fitted link should be left in place otherwise the on-board buzzer will start to sound shortly after powering up eXcel[4].

eXcel terminal	Function
22	Door 1 Door sense input
23	Door 1 Door sense 0V
36	Door 2 Door sense
37	Door 2 Door sense 0V
49	Door 3 Door sense input
50	Door 3 Door sense 0V
55	Door 4 Door sense
56	Door 4 Door sense 0V

Egress buttons

Most egress buttons have contacts that are closed when the button is pressed. If fitting one where the opposite is true, make the appropriate selection in eXguard.

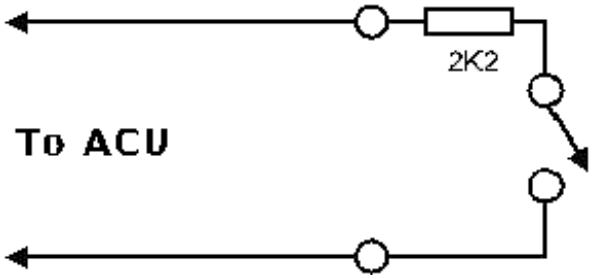
eXcel terminal	Function
23	Door 1 Egress 0V
24	Door 1 Egress input
37	Door 2 Egress 0V
38	Door 2 Egress input
50	Door 3 Egress 0V
51	Door 3 Egress input
56	Door 4 Egress 0V
57	Door 4 Egress input

Inputs

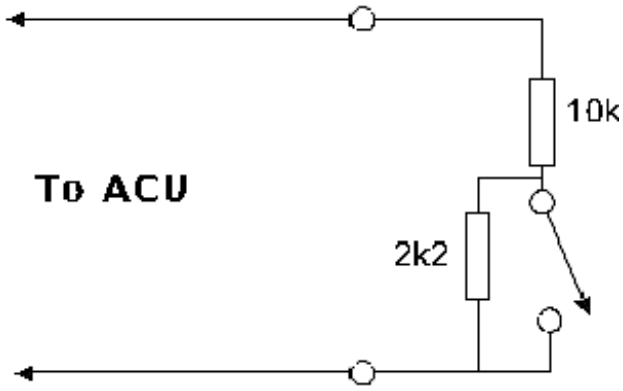
eXcel terminal	Function	Only available in the following configurations
36	Input 3	1 Door
37	0V (for Inputs 3 & 4)	
38	Input 4	
49	Input 5	1 or 2 Door
50	0V (For inputs 5 & 6)	
51	Input 6	
55	Input 7	1, 2 or 3 Door
56	0V (For inputs 7 & 8)	
57	Input 8	

Supervision options

eXcel[4] can detect and report tampering with an input, if one of the two configurations below is used. The two options are referred to as US and UK because of the countries in which each type is most prevalent. The resistor(s) should be installed as close to the switch as possible to provide maximum protection.



1-resistor supervision (US) for short-circuit tamper detection



2-resistor supervision (UK) for short-circuit and open-circuit tamper detection

Relays

Note that relays are limited to 30V 2A non-inductive load. Any load that exceeds this MUST be controlled using a suitable separate relay. If the load is of an inductive nature (motors, bells, locks, relays etc.) then the load MUST have a suppressor fitted in the same way as for a lock.

eXcel terminal	Function	Only available in the following configurations
33	Relay 2 n/c	1 Door
34	Relay 2 pole	
35	Relay 2 n/o	
46	Relay 3 n/c	1 or 2 Door
47	Relay 3 pole	
48	Relay 3 n/o	
52	Relay 4 n/c	1, 2 or 3 Door
53	Relay 4 pole	
54	Relay 4 n/o	

Commissioning and Trouble-shooting

Connect the memory battery using the jumper on the eXcel board.

Testing the installation

The installation can be tested without using the computer by doing the following:

1. Apply power to the eXcel[4]. The LED on the reader(s) should start flashing at about two flashes per second.

   (If a door sensor is fitted to Door 1, the on-board buzzer may sound after 15 seconds. If this happens it is because the ACU thinks the door is open, and is signalling that the door has been left open too long. If the door is in fact closed, this can be corrected once eXguard software is talking to eXcel[4]. Temporarily, silence the buzzer by opening the door or replacing the factory-fitted link across the door sensor inputs).
2. Present a card to one of the readers. The flashing rate should change to one flash every two seconds.
3. Present the card again – relays 1 and 2 should be energised for 5 seconds. (At this stage, the eXcel[4] has not been told whether it is a one-door or two-door installation). Note that until the first card is programmed using eXguard, ANY card of the correct technology will trigger both relays.
4. If an egress button is fitted, press it. The associated lock should operate for as long as the button is pressed, and remain operated for 5 seconds after the button is released.

Communications set up

Make a note of the 12-digit UID of each eXcel[4] unit in the system (this is visible through a window in the connection label). Once eXguard is started on the PC, this information is needed at the time of adding the ACU details into the database. For units connected via Ethernet, the IP address will also be required. Once the required information has been entered, you can start (or re-start) eXguard Communications and the computer will start communicating with the ACUs.

Fault-finding communications problems

eXguard will indicate if it has failed to communicate with any ACU, and the red and green LEDS on the eXcel[4] boards can be used to assist with troubleshooting. Note that this type of problem is more easily resolved by disconnecting the RS485 connections from ALL eXcel[4] units and trying to bring them on-line one at a time – a faulty connection at one unit could prevent communication with all units.

Red LED flashing rapidly, green LED flashes every 1-5 seconds	Normal behaviour by eXcel[4] – if eXguard software reports ACU as "off line" then data transmitted by eXcel is either not reaching the PC or the eXcel[4] A and B Tx (transmit) data lines are reversed.
No LEDs flashing	Data transmitted by PC is not reaching eXcel[4]
Only RED LED flashing	Data transmitted by PC is reaching eXcel[4] but either eXcel[4] serial number has not been entered correctly or the eXcel[4] A and B Rx (receive) data lines are reversed

A diagnostic tool – eXmonitor.exe – is available. This will display a list of all units that are capable of communicating correctly and provides a quicker, simpler way of troubleshooting. The tool is installed automatically in the eXguard program directory, but with no shortcut – run it directly from the folder.

Final configuration

Final configuration involves using eXguard to program the required features into eXcel[4]. Please refer to the help system in eXguard for further guidance.

Connection tables

Power and communications

eXcel terminal	Function	Notes
1	RS485 TX A	The descriptions "A" and "B" are not always consistent between various manufacturers. To avoid problems, always follow the pin-to-pin tables in this manual.
2	RS485 TX B	
3	RS485 RX A	
4	RS485 RX B	
5	RS232 0V (SG)	
6	RS232 RX	
7	RS232 TX	
8	RS232 RTS	
9	RS232 CTS	
10	12V DC Power supply IN	
11	Power supply Ground	

MA-45 RS232/RS485 converter

MA-45	eXcel^4
1	2
2	1
3	4
4	3
5	No connection

Connecting one eXcel^4 to another

eXcel^4	eXcel^4
3	3
4	4
1	1
2	2

Readers and doors

eXcel terminal	Function	Alternate use
12	+5V OUT	
13	0V OUT	
14	Reader 1 MAG-DATA	
15	Reader 1 MAG-CLK	
16	Reader 1 LED	
17	Reader 1 +12V	
18	Reader 1 0V	
19	Door 1 Lock relay n/c	
20	Door 1 Lock relay pole	
21	Door 1 Lock relay n/o	
22	Door 1 Door Sense	
23	0V (for Door Sense and Egress)	
24	Door 1 Egress	
25	Reader 2 MAG-DATA	
26	Reader 2 MAG-CLK	
27	Reader 2 LED	
28	Reader 2&3 +12V	
29	Reader 2&3 0V	
30	Reader 3 MAG-DATA	
31	Reader 3 MAG-CLK	
32	Reader 3 LED	
33	Door 2 Lock relay n/c	Relay 2 (1, 2 or 3-door configuration)
34	Door 2 Lock relay pole	
35	Door 2 Lock relay n/o	
36	Door 2 Door Sense	Input 3 (1, 2 or 3-door configuration)
37	0V (for Door Sense and Egress)	
38	Door 2 Egress	Input 4 (1, 2 or 3-door configuration)
39	+5V OUT	
40	+5V OUT	
41	Reader 4 MAG-DATA	
42	Reader 4 MAG-CLK	
43	Reader 4 LED	
44	Reader 4 +12V	
45	Reader 4 0V	
46	Door 3 Lock relay n/c	Relay 3 (1, 2 or 3-door configuration)
47	Door 3 Lock relay pole	
48	Door 3 Lock relay n/o	
49	Door 3 Door Sense	Input 5 (2 or 3-door configuration)
50	0V (for Door Sense and Egress)	
51	Door 4 Egress	Input 6 (2 or 3-door configuration)
52	Door 4 Lock relay n/c	Relay 4 (1, 2 or 3-door configuration)
53	Door 4 Lock relay pole	
54	Door 4 Lock relay n/o	
55	Door 4 Door Sense	Input 7 (2 or 3-door configuration)
56	0V (for Door Sense and Egress)	
57	Door 4 Egress	Input 8 (2 or 3-door configuration)

Compliance Notices

Compliance with CE regulations

The equipment is designed, tested and declared to conform to the following CE directives:-

89/336/EEC	EMC Directive
93/68/EC	Low Voltage Directive

The equipment has been tested and found to comply to the following EMC & Safety standards:-

Electromagnetic emission	EN 55022:1994
Electromagnetic emission	EN 50081-1:1992
Electromagnetic immunity	EN 50082:1995
Electromagnetic immunity	EN 50130-4:1995
Safety of IT Equipment	EN 60950

Limitations on the intended operating environment.

The equipment is intended for use in access control applications in a wide range of configurations. It is intended for use with third party equipment attached at the power supply input, the reader inputs, various control outputs and the data communications ports. Such third party equipment, and all cabling must be of suitable design and installation to ensure that the overall system complies with the requirements of the EC EMC directive.

The equipment in OEM Module form complies with the RFI emission and immunity, and electrical transient immunity regulations. Compliance with the ESD regulations will be the responsibility of any installer that mounts the OEM module in an alternative outer case.

Guidance notes for the installation and use of TDSi equipment must be strictly followed. Due to the wide range of access control products TDSi notes cannot cover all possible type and combinations of equipment that may be assembled to form a total system.

TDSi exercise due diligence to ensure that its equipment is suitable for use in the stated applications, but ultimate responsibility for the compliance of a complete system must rest with the prime contractor at a site where local conditions may require additional EMC precautions to be taken.

FCC Regulations Notice

This device complies with Part 15, Class B, of the FCC Rules. Operation is subject to the following two conditions:-

a) This device may not cause harmful interference.

b) This device must accept any interference received, including interference that may cause undesired operation.

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instructions, may cause interference harmful to radio communications.

There is no guarantee, however, that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

CSA EMC Notice.

This digital apparatus does not exceed the Class B Limits for radio frequency emissions from digital apparatus set out in the radio interference regulations of the Canadian Department of Communications.

Le present appareil numerique n’emet pas de bruits radioelectriques depassant les limites applicable aux appareils numeriques de la Class B prescrites dans les reglement sur le brouillage radioelectrique edicte par le Ministere des Communications du Canada.

Safety Notices

Product description

These notes apply to TDSi eXcel[4] Access Control Units with an internal ACU PSU mains power supply fitted. A 230v, 50 Hz AC mains supply must be connected to the equipment by a permanently connected wiring installation as described below.

Rating

The TDSi eXcel[4] Access Control Units with an internal AC PSU mains power supply fitted are powered from a 230v, 50Hz mains supply & draw a maximum supply current of 0.4A.

Safety

WARNING: Disconnect the mains supply before removing the covers or making connections to the equipment.

All regulations and requirements MUST be must strictly followed to prevent hazards to life and property both during and after installation, and during any subsequent servicing and maintenance.

Positioning and fixing of equipment

The equipment must not be installed out of doors or in damp or exposed conditions.

To ensure mechanical stability the equipment must be secured using appropriate fasteners or brackets to a wall, pillar or other part of the building structure, or to associated stable equipment.

The equipment must not be sited near to sources of heat. It is designed for use in ambient temperatures ranging from 0 to 40 degrees C.

Connecting a permanently wired mains supply to the equipment.

Ensure that the mains supply is SWITCHED OFF before starting any wiring.

Wiring should be in accordance with the current I.E.E. regulations, or the appropriate standards in your country, and should be performed by a properly qualified electrician.

For permanently connected equipment a readily accessible disconnect device shall be incorporated in the fixed wiring.

Wiring should be via a switched, fused spur with a 3A fuse (UK) rating, and should use approved 3 core mains cable of minimum cross section area 0.75 sq mm. The installation MUST be provided with a double pole isolator switch with a contact separation of at least 3mm. The Earth wire into the terminal block should be left longer than the L & N wires so that it is pulled out last if the cable is strained.

Connecting signal wiring to associated equipment.

The TDSi eXcel[4] Access Control Units with an internal AC PSU mains power supply fitted must be connected to other equipment forming part of an overall control system using signal wiring connections made with screened cable with the screen securely connected to an earth point at the controlled equipment end and at earth points within the eXcel[4] equipment. Where individual remote equipment is locally earthed it is permissible to disconnect the cable screen earth connection at one end of the cable.

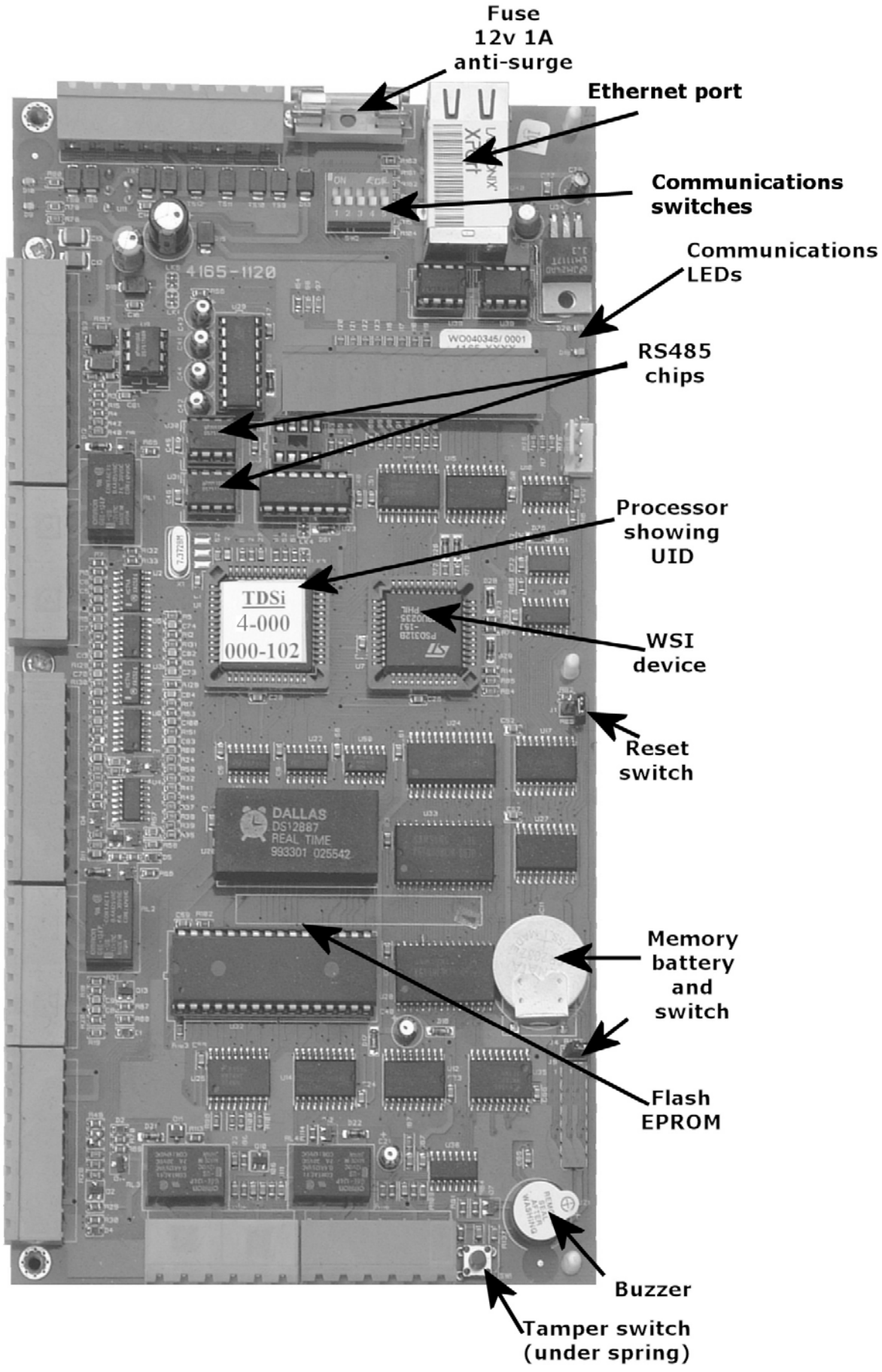
Internal fuse rating

The low voltage DC Regulator PCB in eXcel[4] is fitted with fuse protection marked FUSE. In case of failure FUSE should be replaced with a 3A (T) Slow-blow 20mm Fuse (TDSi part number 2021-0034).

The Reader Connect PCB is fitted with fuse protection marked F1. In case of failure F1 should be replaced with a 1.6A (T) Slow-blow 20mm Fuse (TDSi part number 2021-0036).

Lithium battery

The Lithium battery is only fitted to the eXcel[4] board. For this to be operational jumper J4 needs to be connected. The battery will support eXcel[4] memory for a maximum of 10 years in normal environmental conditions.

The clock chip mounted on eXcel[4] board has it only internal battery, which will retain memory to the clock chip for a maximum of 10 years under normal operating conditions.

Board layout